## DEFENSE THREAT REDUCTION AGENCY

The Defense Threat Reduction Agency (DTRA) is actively involved in meeting current threats to the Nation and working toward reduction of threats of all kinds in the future. To meet these requirements, the Agency is seeking small businesses with strong research and development capability. Expertise in weapons effects (blast, shock and radiation), arms control, and counterproliferation technologies will be beneficial. Proposals will be accepted only by electronic submission at www.dodsbir.net.

The proposals will be processed and distributed to the appropriate technical offices for evaluation. Questions concerning the administration of the SBIR program and proposal preparation should be directed to:

Defense Threat Reduction Agency
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Use of e-mail is encouraged for correspondence purposes.

DTRA has identified 8 technical topics numbered DTRA 01-001 through DTRA 01-008. Proposals must be submitted electronically. Proposals which do not address the topics will not be accepted. The current topics and topic descriptions are included below. The DTRA technical offices that manage the research and development in these areas initiated these topics. Proposals may define and address a subset of the overall topic scope. Questions concerning the topics should be submitted to Mr. Yoho at the above address or to the POC identified for the topic.

Potential offerors must submit proposals in accordance with the DoD Solicitation document. Consideration will be limited to those proposals that do not exceed $100,000 and six months of performance. For information purposes, Phase II considerations are limited to proposals of $750,000 and 24 months of performance or less.

DTRA selects proposals for funding based on the technical merit of the proposal, criticality of the research and the evaluation criteria contained in this solicitation document. As funding is limited, DTRA reserves the right to select and fund only those proposals considered to be superior in overall technical quality and filling the most critical requirements. As a result, DTRA may fund more than one proposal under a specific topic or it may fund no proposals in a topic area. Proposals applicable to more than one DTRA topic must be submitted under each topic.

While funds have not specifically been set aside for bridge funding between Phase I and Phase II successful proposals, the potential offeror is advised to read carefully the conditions set out in this solicitation for FAST TRACK Phase II awards.

Notice of award will appear first in the Agency Web site at http://www.dtra.mil. Unsuccessful offerors may receive debriefing upon written request only. E-mail correspondence is considered to be written correspondence for this purpose and is encouraged.

**DEFENSE THREAT REDUCTION AGENCY 03.1 Topic List**

## DEFENSE THREAT REDUCTION AGENCY 03.1 TOPIC DESCRIPTIONS

DTRA03-001 TITLE: Stand-off Uranium Detection

TECHNOLOGY AREAS: Sensors, Nuclear Technology

OBJECTIVE: DTRA requires the capability to detect 1kg of highly enriched uranium (HEU) shielded by a 1 mm lead shield from a 2 meter standoff position in less than 1 minute. The sensor should be man-portable, battery-operated and capable of field operation by capable field personnel with a minimum of training. The unit should be capable of operating for 12 hours without recharging. The sensor, less power source, should be transportable as checked baggage on commercial airlines. Unit should be free of liability or safety issues. Operation at a standoff distances of 20 meters is desirable.

DESCRIPTION: A minimal amount of shielding drastically decreases the radiation signature of uranium. Passive radiation detection technologies for shielded highly enriched uranium rely on the detection of impurities whose presence and relative abundance vary widely. Active radiation detection techniques present potential liability issues in public or non-controlled settings and possible safety issues in other settings. Under international agreements, monitoring HEU storage with confidence may become a problem. In border and portal monitoring situations, active techniques may only be used if
personnel are isolated from packages, an operational restriction on deployment. At larger standoff distances, current passive and active radiation detection approaches have very poor sensitivity. A standoff detector capable of sensing shielded HEU either passively or with minimal active interrogation would be of interest to DTRA.

PHASE I: Develop a HEU detection system design capable of meeting most of the Objectives presented above (detection of 1 kg of uranium shielded with 1 mm of lead at 2 meters standoff), preferably without active interrogation of the uranium or with minimal interrogation (on the order of 1 microCurie equivalent). Demonstrate that the design is feasible experimentally.

PHASE II: Develop and demonstrate a prototype system with a weight, ruggedness, and environmental resistance sufficient to meet the topic objectives. The system, less power source, must be transportable as checked baggage on commercial airlines. Conduct testing to prove feasibility over extended operating conditions.

PHASE III DUAL USE APPLICATIONS: The detector proposed has a wide variety of military and commercial applications in surveillance and security, particularly in homeland security. Examples are remote and perimeter monitoring, securing industrial facilities, border and event monitoring, and container security evaluations.

KEYWORDS: Arms control verification, arms control compliance, uranium detection, portable HEU detectors, homeland security, counter-terrorism.

DTRA03-002 TITLE: High Resolution, Room Temperature Radiation Detectors

TECHNOLOGY AREAS: Sensors, Nuclear Technology

OBJECTIVE: DTRA requires a gamma-ray detector that will operate at room temperatures and provide higher resolution than presently available from room temperature detectors. The detector should be capable of resolutions on the order of one percent or better at 662 keV.

DESCRIPTION: Arms control agreements, as well as other international agreements, can require the ability to detect plutonium and distinguish weapon-grade plutonium from reactor-grade plutonium. Detection of other radioisotopes may also be required. Present high-resolution detectors using High Purity Germanium provide resolutions as low as 0.1 percent. However, High Purity Germanium requires cooling to cryogenic temperatures – either by liquid nitrogen or an electromechanical cooler. Cooling by these means often is not practical for remote applications or for portable applications. Room temperature semiconductor-based ($HgI_2$ and CdZnTe) and scintillator-based detectors (e.g., NaI) are available but have poorer resolutions. The two semiconductors mentioned above can achieve resolutions of about two to three percent while most scintillators can achieve resolutions on the order of six percent. Some recent advances in scintillators (e.g., LaCl3:Ce) show that resolutions between three and four percent may be achievable. None of these existing room-temperature detectors can, at present, satisfy DTRA needs. DTRA therefore seeks detectors based on new materials that can operate at room temperature and offer the potential of resolutions (at 662 keV) on the order of one percent or less. Improved detection schemes based on improved software or improved electronics are not of interest.

PHASE I: Develop a room-temperature gamma-ray detection system design, using new materials for the detector, that offers the potential of achieving a resolution of one percent or better. Experimentally demonstrate that the design and achieving a one percent or better resolution is feasible.

PHASE II: Develop a prototype system and conduct tests sufficient to demonstrate proof-of-concept.

PHASE III DUAL USE APPLICATIONS: The detector proposed has a wide variety of military and commercial applications in surveillance and security, particularly in homeland security. Examples are remote and perimeter monitoring, securing industrial facilities, border and event monitoring, and container security evaluations. However, the biggest potential commercial use would be medical imaging.

KEYWORDS: Arms control verification, arms control compliance, plutonium, radionuclides, plutonium detection, room-temperature detectors, gamma detectors, gamma radiation, homeland security, counter-terrorism

DTRA03-003 TITLE: Container Characterization

TECHNOLOGY AREAS: Chemical/Bio Defense, Sensors

OBJECTIVE: DTRA requires sensors that will confirm that the contents of a sealed container are what have been declared to be in these containers.

DESCRIPTION: Under arms control agreements, sealed containers are declared to contain certain items. These items could include explosives, special nuclear materials, other radioactive sources or non-nuclear objects. A wide range of containers may be encountered, from missile tubes to 55 gallon drums to cardboard boxes. Technologies currently under investigation to confirm, verify or assure the presence or absence of declared objects or quantities include gamma/x-ray, neutron and active (e.g., neutron or proton induced radiation) interrogation detection systems. Current radiation detection systems include semiconductors and scintillator materials for gammas, for the most part heliumr-3 detectors for neutrons, and neutron generators and particle accelerators for active detection. Sensitivity, personnel and process safety, ruggedness, weight, power use, time and distance/standoff requirements are common problems with these commercial systems. Explosives detection is being done via swipes or material sampling which assumes that some of the material is outside the container. A properly sealed container could thwart current explosives detection techniques. Existing technologies either have technical, operational, safety and/or security issues with respect to arms control applications. Technical issues include sensitivity and discrimination. As any work around nuclear and explosives materials is considered beyond industrial hazard risk threshold, detection system safety is also a consideration. Operational constraints include ruggedness in remote environments, timeliness and process integration. Detection systems are needed throughout nuclear operations processes including weapon and component staging and dismantlement. Therefore DTRA is seeking innovative methods to detect the presence or absence of these declared items. The proposed method or technology could address just one, several or all possible contents of these containers. The references below describe technologies representative of the current state-of-the-art.

PHASE I: Develop an innovative system design that offers the potential of confirming the absence or presence of one or more classes of objects (explosives, radioisotopes or special nuclear materials (plutonium or uranium), or non-nuclear objects) inside sealed containers. Demonstrate experimentally that the design is feasible.

PHASE II: Develop a prototype system and conduct tests sufficient to demonstrate proof-of-concept.

PHASE III DUAL USE APPLICATIONS: These technologies could have a wide variety of military and commercial applications in surveillance and security, particularly in homeland security. Examples are remote and perimeter monitoring, border and port monitoring, and container security evaluations.

REFERENCES:
Commercial Instruments: www.ortec-online.com, www.canberra.com, and www.berkeleynucleonics.com
Laboratory: Proceedings of the 43rd Annual Meeting of the Institute of Nuclear Materials Management, June 23-27, 2002 and references therein.

KEYWORDS: Arms control verification, arms control compliance, plutonium, uranium, radionuclides, explosives, homeland security, counter-terrorism

DTRA03-004 TITLE: In Situ Reentry Vehicle On-Site Inspection

TECHNOLOGY AREAS: Sensors, Weapons

OBJECTIVE: Reentry Vehicle On-Site Inspection (RVOSI) is an important component of the START I Treaty between the United States and Russia. However, considerable time and effort is now expended to perform an RVOSI. The front section of a designated missile must be removed from the missile, transported to a missile maintenance facility, and the aerodynamic shield removed so that an inspecting party may visually count the number of RVs present. Considerable time and effort would be saved and nuclear safety increased if both the U.S. and Russia could perform in situ RVOSIs.

DESCRIPTION: For in situ RVOSIs to become a valid inspection technique under the START agreement, the inspection party (both those of the U.S. and Russia) would need a transportable sensor that could be set up in near proximity to operational ICBMs in ground silos and on mobile transporter-erector-launchers (TELs). This sensor would then need to identify the number of nuclear weapons onboard the missile through the aerodynamic shield within a reason period of time (e.g., within a few hours). The following is an illustrative set-up for this hypothetical sensor performing an in situ RVOSI of a mobile missile:

The SS-25 ICBM is a Russian mobile missile mounted on a TEL when operationally deployed. Under the START Treaty, the SS-25 is attributed with one nuclear warhead, but it potentially could carry more than one warhead. The objective of a RVOSI of an operational SS-25 would be to confirm that it is indeed armed with only one nuclear warhead. However, in theory more than one RV could be legally carried by an SS-25 so long as only one nuclear warhead was aboard the missile. (The additional RVs would obviously be decoys).

For purposes of these calculations only, RVs (containing either a nuclear warhead or a decoy) are right circular cones measuring about 0.67 to 1.0 meters in diameter at their base and about 1.7 to 1.9 meters in height. The nuclear warhead in a RV is close to the base of the right circular cone.

If a sensor could be elevated a few meters above the ground on a stand or a tripod to the height of the horizontal-laying SS-25 missile's longitudinal axis, then the sensor could look straight on at the missile's front section from a distance of 4 to 5 meters. A greater distance would be allowed if the greater distance is useful to the sensor’s performance.

It would also be possible to set up the sensor on either side of the missile's front section at a distance of 4 to 5 meters (or some greater distance if useful) such that the line-of-sight from the sensor was perpendicular to the missile's longitudinal axis. When set up on either side of the missile's front section, it would be possible to raise or lower the sensor a few meters so as to generate different angular views of the missile's front section. It might also be possible to view the missile's front section from ground level directly below the missile's front section as this portion of the missile extends out over the TEL's front end.

PHASE I: Develop a sensor that offers the potential of performing RVOSI as described above. Demonstrate that the design is feasible experimentally.

PHASE II: Develop a prototype sensor system that would be transportable and operable in a field environment. Conduct tests sufficient to demonstrate proof-of-concept.

PHASE III DUAL USE APPLICATIONS: The sensor proposed would have a wide variety of military and commercial applications in surveillance and security, particularly in homeland security. Examples are remote monitoring, securing industrial facilities, border and event monitoring, and container security evaluations. However, the biggest potential commercial use would be in industrial and medical waste imaging.

KEYWORDS: Arms control verification, arms control compliance, START, RVOSI, plutonium, radionuclides, plutonium detection, room-temperature detectors, gamma detectors, gamma radiation, homeland security, counter-terrorism

DTRA03-005 TITLE: X-Ray Simulator Enabling Technologies

TECHNOLOGY AREAS: Nuclear Technology

OBJECTIVE: Develop innovative technologies to enhance DoD's x-ray simulator capability for commercial, industrial, civilian and Government applications.

DESCRIPTION: This solicitation is for research and development (R&D) on concepts, systems, components, software, diagnostics, etc. related to the DoD's x-ray radiation simulator research and development and advanced pulsed power technology program - i.e., DoD project BH (System Survivability), Program element 0602717BR (Defense Technologies) managed by the Defense Threat Reduction Agency - that will result specifically in commercial, industrial, civilian and Government applications besides those of the radiation simulator program.

The DoD's program has focused upon development of high-energy density storage, high coulomb switching, electrical transmission and load technologies, and the application of these technologies to research laboratory systems that produce very intense, short time period x-rays and gamma radiation. These systems have been crucial for testing DoD operational system components and ensuring that the systems will operate if exposed to an offensive or defensive nuclear weapon burst. The radiation simulators provide the capability for relatively cost effective testing of DoD systems. Plasma radiation source (PRS) devices that produce 1-15 keV x-rays are typically gas puffs or wire arrays that are imploded by large electric currents. Present PRS designs are limited by Rayleigh-Taylor, magneto-hydrodynamic (MHD) and other instabilities. Future innovative load designs, therefore, may enable more efficient x-ray production and increased x-ray fluence. An important contribution could result from physics-based modeling of the complex PRS system, particularly with high-performance parallel computers now available. Bremsstrahlung radiation source (BRS) devices generate x-rays >100keV and gamma radiation by impinging electron beams onto target converters. Improvements could be affected by innovative new BRS designs or by better understanding and refinement of BRS designs. Comprehensive computer modeling (e.g., particle-in-cell (PIC) codes) of cathode formation and electron emission, beam transport, and/or converter physics could provide important contributions. The latest generation of DTRA high-power generators has a relatively large pulse length (~300 ns) which is problematic for plasma radiation sources and bremsstrahlung sources. Novel pulse compression technology - e.g., plasma opening switches (POSs), flux compression, and current multiplication methods - could be important for improving performance. Better computer modeling is needed to understand the opening process in POSs and the dynamics of flux compression. Future improvements in production of x-rays with energies between those produced by PRS and bremsstrahlung sources may require new concepts for source design, power generation, pulse compression, experimental and measurement techniques, data analysis and modeling, and methods to reduce facility system and operation costs. Research and development on spin-offs related to these energies, and related measurement and diagnostic techniques, are of particular interest to this solicitation.

DoD's x-ray radiation simulator program has been noted for its efforts to ensure that technical spin-offs address commercial, civilian and Goverment needs. Significant improvements have been made to capacitors through efforts between 1972 and 1993 (i.e., in dielectric constant, breakdown strength and size; 10s to 100s of kiloamperes, 10s to 100s of kilovolts per capacitor). Capacitors with these ranges of parameters are important in lasers, free-electron lasers and ultra-wideband/high power microwave systems. Significant advances were made between 1988 and 1999 in electric armor; electromagnetic/electric guns (e.g., all electric ship, tank, extended range gun; vertical gun), and in electro-thermal chemical (ETC) and advanced munitions (e.g., Extended Range Guided Munition). Spin-offs have influenced many industrial/civilian applications, to include modern defibrillators and chemical and biological cleanup systems. Other examples include new nuclear instrumentation, material surface treatments, metal cutting equipment, and high brightness x-ray sources. The new technologies and technical advancements related to the DoD's x-ray radiation simulator program that are developed under this solicitation are expected to result in similar important commercial, industrial, civilian and Government spin-offs.

During Phase I, demonstrate the feasibility of the proposed concept.

During Phase II, develop, test and evaluate proof-of-principle hardware or software. In the event the contractor proposes to demonstrate the prototype in an above ground test simulator, DTRA will coordinate the demonstration at its facility.

PHASE III DUAL USE APPLICATIONS: The Phase I proposals should describe and quantify the manner in which the technologies to be developed could be useful for commercial, industrial, civilian and Government applications. When the technologies to be developed also have application to the DoD's radiation simulator program, such application will be of secondary importance to the other commercial, industrial, civilian and Government applications.

REFERENCES:
(1)Inductive Energy Technology for Pulsed Intense X-Ray Sources, K. D. Ware, P. G. Filios, R. L. Gullickson, J. E. Rowley. R. F. Schneider, W. J. Summa, I. M. Vitkovitsky, IEEE Transactions on Plasma Science, Vol. 25, No. 2, April 1997.
(2)Glasstone and Dolan, The Effects of Nuclear Weapons, 1977.
(3)DNA EM-1, Capabilities of Nuclear Weapons.
(4)Radiation Test Facilities and Capabilities, 1997, DASIAC, 2560 Huntington Ave., Alexandria, VA 22303 (also at http://www.dtra.mil/td/nuc_rad/td_simA.html).
(5)J. C. Martin on Pulsed Power, Edited by T. H. Martin, A. H. Guenther, and M. Kristiansen, Plenum Press, New York and London, 1996, ISBN 0-306-45302-9.

KEYWORDS: Advanced Simulator, Above Ground Test (AGT), X-Ray, Debris, Pulsed Power, Radiation, Simulation, Modeling, Test, Electronics, Optics, Nuclear Weapon Effects, Electromagnetic, Electrothermal, Hybrid Electric Guns, High Coulomb Switches, Crowbar Diodes, High Energy Capacitors, Static Electrical Storage Devices.

DTRA03-006 TITLE: Advanced Computational Techniques for Hard & Deeply Buried Target Defeat (HDBTD) Problems

TECHNOLOGY AREAS: Weapons

INTRODUCTION: The defeat of hard & deeply buried targets is one of the most critical problems facing the United States today. The DOD has established a concentrated program to apply force to counter the proliferation of these targets across the spectrum of defeat capabilities. The warfighter needs robust planning and assessment tools to surgically apply force to deny an adversary the capability to hide in underground sanctuaries by providing an organized end-to end capability to analyze, plan attack options, and assess attack effectiveness. Owing to complexity of the problem and the very large number of possible scenarios, i.e. weapons, target construction, topography, geology, etc., the cost of developing fast-running planning and assessment tools based on empirical data alone is prohibitive.

OBJECTIVE: reduce and improve the fidelity of assessment tools by applying advanced numerical techniques and high performance computing capability to the HDBTD counter-force problems.

DESCRIPTION: Since, current advanced computational fluid dynamics and/or computational structural dynamics codes such as the many large scale finite element or finite difference codes fail to address all the necessary physics, do not incorporate emerging computational techniques, or take full advantage of the latest scaleable computer hardware. The objective of the effort is to capture emerging technologies and to apply them to advanced computational tools for HDBTD problems. The technologies fall into three broad categories:

Physics enhancements: The technologies appropriate include but are not limited to developing more realistic material models for structural and geological materials addressing fracture, or high strain rate, large deformation response, numerical implementation of equations of state for non-ideal explosives and other energetic materials such as bi-metallics, inter-metallics, etc. including afterburning, improved chemical kinetic models, low-mach number flow approximations, turbulence modeling, premixed and non-premixed combustion modeling, human effects prediction, etc.

Emerging computational techniques: The emerging technologies focus on enhancement to advanced computational fluid dynamics and/or computational structural dynamics such as the many large scale finite element or finite difference method are required. Theses include but are not limited to adaptive mesh refinement, mesh-free techniques such as element free galerkin or free lagrangian techniques, integration of weather observations into numerical weather models, and transport and diffusion models, etc.

Code implementation on advanced scaleable computers. Two issues dominate the fully scalable computations. The first issue deals with the development and implementation of scalable and coupled algorithms consistent with all pertaining governing differential equations implemented in the finite element, finite difference or other solution technique. Technologies to develop adaptive mesh refinement or other advanced numerical techniques on parallel computers while maintaining scalability are sought. The second technology is mostly associated with data movement, data management, and visualization associated to enhance computational tools for HDBTD problems. These technologies may utilize standard Hierarchical Data Formats, heterogeneous shared memory system, high performance scientific visualization, and simple object oriented and Extensive Markup Language (XML) tools.

PHASE I: Demonstrate that the capability of the new and innovative research can substantially improve the capability of computational tools in the above areas. This may be accomplished using an existing tool as the test bed or by developing special purpose prototype software. A limited number of demonstration problems will be run.

PHASE II: Develop working prototype software that includes the appropriate pre/post processing and realistic modeling capability. This may be accomplished modifying an existing tool as the prototype or by developing unique prototype software. A limited number of realistic demonstration problems will be run.

PHASE III/DUAL USE COMMERCIALIZATION: In Phase III this capability will provide the DOD S&T user a fully capable advanced computational tool that can be used for weapon development trade studies or for application of force to real-world problems. Dual use commercialization may consist of spinning-off the components of the tool such as: material models by the earthquake and anti-terrorism industry, combustion models to the engine developers, mesh-free and adaptive mesh techniques to the automobile industry. Additionally, the integrated tool could be applicable to governmental organizations such as the newly established Homeland Defense Agency, FEMA and EPA for hazard prediction for terrorist events from explosive events both military and improvised explosives.

KEYWORDS: Numerical methods, computational mechanics, weapons effects, material models, combustion.

DTRA03-007 TITLE: Standoff Detection of Aerosolized Biological Agents

TECHNOLOGY AREAS: Chemical/Bio Defense, Sensors

OBJECTIVE: 1) Detect particulate aerosols in the 2-10 micrometer range, 2) discriminate between biological and non-biological particles, 3) develop low-cost, ruggedized, instrument having a small footprint.

DESCRIPTION: In FY03, DTRA will initiate a program to develop an integrated prototype system for urban biological defense. Key components of the system include environmental monitoring, medical monitoring and public health surveillance. This topic specifically addresses a need for environmental detectors that can be used in urban environments for early detection of biological aerosols. Current systems rely on biological point collectors or point detectors. In the case of collectors, samples are obtained over an extended period of time, trapped by cyclonic concentrators or membrane filters, and analyzed in a central laboratory. Biological point detectors use trigger devices to detect biological aerosols and initiate sample collection. Sample collection is followed by on-board or laboratory analysis. In both cases, these systems are limited to detecting aerosols that pass within the sampling port of the device. Thus, their performance is dictated by not only the concentration of the agent in the aerosol, but by the dispersion and migration of the plume.

DoD has attempted to rectify the performance limitations of biological point detectors through the development of standoff systems based on IR laser ranging and UV laser-induced fluorescence. Operational considerations require a high-energy laser system for standoff applications on the battlefield. This leads to systems with high power demands, large optics, and excessive cost, bulk and weight for use in urban settings. A small, relatively short range detection instrument would be useful for deployment in the city environment.

The contractor should propose innovative monitoring solutions that can lead to the development of a low-cost, autonomous, remote/stand-off biological aerosol detector. The instrument should be capable of performing: 1) particle sizing in the 2-10 micrometer range, 2) detecting and discriminating biological particles, 3) operational at range of 1000 meters, 4) all-weather and day/night capability, and 5) safely operable in an urban environment (e.g., eye-safe lasers, no hazardous reagents, no high-energy emissions, etc.).

PHASE I: Develop overall system design and demonstrate proof-of –concept.

PHASE II: Develop prototype instrument and conduct live agent chamber testing and simulant field testing.

PHASE III DUAL USE APPLICATIONS: Current biological agent detection systems rely on point detectors. A significant performance limitation of point detectors is their inability to sample, in real-time, actual aerosol conditions. Additionally, point detectors cannot sample across a large cross-section of the atmosphere. Current stand-off detectors developed by DoD are large, expensive and not suitable for use in urban terrain. A small, cost effective, short-range, stand-off/remote detection system can fill a critical technology gap for protection of both civilian and military personnel in urban terrain.

KEYWORDS: BW, biological, sensors, detection, standoff, remote, aerosol, threat, agent.

DTRA03-008 TITLE: Biological Agent Detection

TECHNOLOGY AREAS: Chemical/Bio Defense, Sensors

OBJECTIVE: Objective: Detection of the presence of a biological pathogen via non-polymerase chain reaction nucleic acid-based approach.

DESCRIPTION: Pathogens can only be detected by examining the micro-organism nucleic acid blue print or the protein building block generated from the genetic blueprint.

In order to achieve a more robust homeland defense capability, it is essential to detect the presence of a biological pathogen in the environment as early as possible. (PCR) based detection detection methods are highly sensitive and specific but require skilled personnel and sophisticated chemical and mechanical processes. However, principles applied in protein detection method such as those applied in home-pregnancy tests can be developed for DNA detection systems. Surface chemistry on a durable platform can be useful in a variety of applications for sequence specific detection of nucleic acid sequences. In addition, the same chemistry can be applied for synthetic ligand-specific to a putative cleff in target proteins.Non-nucleic acid-based detection techniques may not achieve a high degree of specificity and sensitivity. Hovever, a combination of nucleic acid and protein recognition methods may emerge as one decisive approach.

This topic seeks innovative nucleic acid-based or protein-based approaches capable of detecting the presence of target pathogens at very low concentrations. The detection method must be fast and easy to use as well as with high sensitivity and specificity. Design, testing and integration of nucleic acid and protein microarrays for sample preparation and detection are invited.

PHASE I:  Develop overall system design and demonstrate proof-of–concept with simulant or ABO.

PHASE II:  Produce prototype detection units to include all necessary peripheral items such as power units and reagents and conduct tests showing validity of approach and ruggedness in varying environmental conditions.

PHASE III:  Apply technology to multiple platforms for use in static and mobile missions, first responder and military missions.

KEYWORDS: Biological, detection, sensors, microarray, nucleic acid, protein, synthetic lygand